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ABSTRACT

The research question addressed in this paper concerns the degree to which teachers use authentic pedagogy, i.e., teaching strategies that foster authentic learning. Three questionnaires were developed, covering four characteristics of authentic pedagogy: (1) the construction of knowledge in complete task environments; (2) the connection to the students' personal worlds; (3) the value of learning beyond school; and (4) cooperation and communication. In 1994 and 1996 a general questionnaire was administered to 89 teachers at 3 secondary schools. In 1994 half of the first grade students received the mathematics questionnaire (n=442), the remaining half the English questionnaire (n=464). In 1996 first up to third grade received questionnaires (n=1014), half of them on English, half of them on math (n=930). Eighteen teachers of English and math were interviewed on their use of textbooks in the context of authentic pedagogy. The results showed that none of the schools scored highly on the characteristics of authentic pedagogy. Teachers do use examples taken from real life when explaining new subject matter to students, but students' own experiences do not figure as starting points in the lessons. The value of learning beyond school is addressed as far as the textbooks permit. Particularly striking is the difference in perception between teachers and students: the students were far less positive about the degree of displayed authentic pedagogy. The findings indicated that authentic pedagogy demands a big change in the teachers' role, including changes in the use of curricular materials and the development of new teaching strategies embedded in a supporting school organization. Implications for curriculum and classroom practice are suggested. (Contains 62 references.) (ND)

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Constructivism and authentic pedagogy: State of the art and recent developments in the Dutch national curriculum in secondary education

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Abstract

The recently introduced national curriculum for the first stage of Dutch secondary education implies, apart from a change in educational content, a change in educational processes. The knowledge students acquire is required to be related to everyday life and meaningfully embedded in society. Furthermore, the student is expected to use social and cognitive strategies such as collaborating, expressing opinions, and how to do research. The accompanying learning environment require active learners as well as teachers who use various strategies to promote authentic learning.

The research question addressed in this paper concerns the degree to which teachers use teaching strategies to foster authentic learning; in other words, whether they use authentic pedagogy.

The concept of authentic pedagogy is described against the background provided by the professional literature . The design of the study is an in-depth multiple case study. Three questionnaires were developed, covering four characteristics of authentic pedagogy :(i) the construction of knowledge in complete task environments, (ii) the connection to the students' personal worlds, (iii) the value of learning beyond school, (iv) cooperation and communication. In 1994 and 1996 (n=89) a general questionnaire was administered to teachers in the first stage of the innovation process at three participating secondary schools. In addition, two situation-specific questionnaires covering English and mathematics were administered, one in 1994 to half of all first-grade students (n=464, 442) and the other in 1996 to half of all first-to-third grade students (n=1036, n=956). Eighteen teachers of English and math were interviewed on their use of text books in the context authentic pedagogy.

The results show that none of the schools scores highly on the characteristics of authentic pedagogy. Teachers do use examples taken from real life when explaining new subject matter to students, but students' own experiences do not figure as starting points in the lessons. As regards construction of knowledge, teachers sometimes encourage students' initiatives but not in integrated tasks. The value of learning beyond school is addressed as far as the text books permit. Learning tasks in which the results are presented to an out-of-school audience are not used, which may be due to the non-existence of such tasks in the text books. Students are sometimes allowed to cooperate in carrying out tasks, however interdependence in learning tasks is rarely achieved. In fact, the conditions for authentic pedagogy are hardly ever met. Particularly striking is the difference in perceptions between the teachers and their students: the students are far less positive about the degree of displayed authentic pedagogy. We should point out that no meaningful changes occurred during the implementation of the national curriculum between 1994 and 1996.

We conclude that authentic pedagogy demands a big change in the teachers' role, including a change in the use of curricular materials and the development of new teaching strategies embedded in a supporting school organization. The results are viewed in the context of the recent discussion on information processing theory versus radical constructivism. We propose a third way in which the limitations of the literal version of the information-processing metaphor are recognized and the pitfalls of radical constructivism are avoided. Implications for curriculum and classroom practice are suggested.

Introduction

At the start of the school year 1993-1994 a major innovation was introduced for the first stage of Dutch secondary education. All students in the new system receive a national curriculum (called basic education) containing common objectives for 15 subjects and given two years or more to attain these objectives. In the second stage students are reallocated to

different levels, leading to certificates for particular streams.

Apart from changes in academic content, the following characteristics of an 'ideal' teaching-learning process are formulated in the new program: application, skills, and connectedness (ASC). The knowledge to be acquired has to be true to life, i.e., authentic, and relevant to students' everyday lives. Students must be able to benefit from their education in private as well as in their social lives. In addition, students are expected to play a more active part in the learning process. The focus must be on the acquisition of skills: expressing opinions, cooperating in research, making connections with various professional practices and making independent use of criteria for the assessment of work.

Within the schools, more attention must be paid to connections between the different subjects. Teachers are, in line with ASC-characteristics, expected to incorporate characteristics of authentic pedagogy in their teaching and to depart, at least in some respects, from the type of traditional teaching pattern in which teachers do the work and students are left to internalize knowledge products passively.

It is difficult to give an unambiguous definition of authentic pedagogy. Among the connotations associated with the term 'authentic' we find 'real', 'true', 'based on original principles' and 'genuine' (see also the work of Charles Taylor 1991, Fred Newman 1996 and Hans Freudenthal 1973, 1991).

A more precise definition can only be given in the context of the philosophy of education, theories of teaching and learning and innovation movements or practice in particular schools. In this paper the focus is on the nature and the function of the knowledge acquired at schools within the context of the national curriculum for 12-to-15-year olds in the Netherlands, with examples from (foreign) language and mathematics education. In our conceptualization of 'authentic pedagogy', to be defined shortly, we make use of three sources: (i) ideas from the 'pedagogical reform movements', (ii) recent developments in educational psychology, e.g. situated learning and constructivism, and (iii) examples and findings from theoretical and experimental research.

This paper is organized as follows. The theoretical background is described, followed by an overview of the relevant empirical research plus conceptualization and operationalization of 'authentic pedagogy' on the basis of theory and experimental research . In the central part of this paper, the design, methods, analysis and results of the experimental study is described. Finally, the main conclusions are stated and discussed in the context of curriculum innovation.

Theoretical background

Ideas from pedagogical reform movements

Critical pronouncements on school teaching and learning have a long history. In the beginning of this century educational reformers already spoke of the irrelevance of schooling to the real world (Scheibe 1978). These criticisms were meant to indicate that knowledge acquired in classrooms was so formal and abstract in nature that application to everyday life was alien to most students. As a result learning inside and outside school remained unrelated for the most part. These were separate worlds, in which school learning more often than not occupied second place in the interest of the students.

In order to remove this artificial barrier educational reformers, like John Dewey, Ovide Decroly, Peter Petersen and Hans Freudenthal, conceived of learning processes which were to be based on the personal experiences of the students and which would remain connected to those experiences. A basic principle in the work of Dewey and Freudenthal is 're-invention'. Instead of being presented as a closed system, the subject matter originates before the student's eyes by re-invention (Freudenthal, 1973; Franssen & Lagerweij 1987).

Authentic pedagogy is the modern form of ideas about educational reform which has existed for a considerable time. These ideas involve a type of pedagogy in which everyday

experiences play a central role and students' spontaneous interest in the world around them form the basis. In terms of pedagogy the process of 're-invention' is a 'bottom up' rather than a top down' approach. Events and persons from the real world are part of the teaching-learning process wherever possible. Learning experiences are lifelike and instantly applicable to social situations.

Situated learning

The concept of 'authentic pedagogy' has been strongly influenced by new insights into the nature of learning processes. Modern educational psychologists characterize knowledge acquired in schools as 'inert knowledge' (Brown, Collins & Duguid, 1989). Schools are said to convey knowledge which is largely inflexible and unusable in real-life situations, where such knowledge might be useful. In other words, there is no transfer between the two worlds (Simons 1990). The cause of this lack of transfer is identified by educational psychologists as the way in which knowledge is imparted in the schools (see, among others, Brown, Collins & Duguid 1989; Resnick 1987; Rogoff & Lave 1984). Students experience the learning program as an arbitrary set of facts and/or procedures which they internalize passively as listeners, without any intention of applying the knowledge gained.

In the view of a number of educational psychologists (Vygotskij, 1978; Wertsch, 1985; Greeno, 1988; Lave, 1991; De Bruijn, 1993) the acquisition of knowledge is the product of activities that take place in a certain cultural context. This view entails that knowledge is inseparably bound up with the social and physical environment in which it is developed and used rather than being an abstract entity, as often presupposed in schools. The situation largely determines the structure, content and coherence of the concepts used (Brown, Collins & Duguid, 1989), leading to changes in the situation or modifications in the knowledge acquired. In other words, knowledge is linked up with developments and changes in the cultural environment. The use of language presupposes ambiguity since situational contexts provide meaning (Miller & Gildea 1987). According to this conception learning always takes place in context. The ideas associated with this particular view of education are often summed up by the term 'situated learning'.

Situated learning has led to a different view of pedagogy in that the (educational) context is accorded great significance. The school constitutes a context that is different from that of daily life. Lave (1988) has shown that there is little difference between the way ordinary people and professional practitioners learn but that their way of learning differs in a number of respects from the type of learning that takes place in schools. Given this situational perspective Lave's ideas can be said to be related to those of Resnick (1987): In ordinary life working people think and act in real situations; problems presented in school are abstract and lack context; in ordinary everyday life as well as in working contexts problems are often opaque, and adequate structuring is based on people's individual perceptions. By contrast, problems in school contexts are clear, relatively simple, pre-structured, and usually provided with unique solutions; in out-of-school situations several solutions are often possible and acceptable results are negotiable.

Constructivism

Another movement in psychology that has influenced the concept of authentic pedagogy is known as 'constructivism'. Theories within this framework define knowledge as the product of learner's activities (Von Glasersfeld, 1991). Consequently, knowledge is strongly associated with the individual learner. In this context Carpay (1993a) refers to a saying by William James, the pragmatist, that "truth is in the making", providing an indication that constructivism has roots which go far back in the history of philosophy. In this view, rather than being the result of transmission, knowledge is constructed by the learner in the sense that he or she relates new elements of knowledge to already existing cognitive structures (Bruer

1993). The reactivation of existing knowledge is a sine qua non in this process. Knowledge is shaped within a continually changing social context and the idea of objective knowledge is fictitious. Knowledge is created by doing, through research and by actively experiencing reality. This makes it possible for reality to be represented in more than one way (Vanderbilt Cognition and Technology Group 1990). The most important task of the teacher lies in the stimulation and coaching of the learner. In this way the latter develops an independent and active attitude, which is of great importance for his or her functioning in a modern, dynamic society (Taylor, 1991).

Empirical Background

State of the art

In 1989 a large-scale survey, combined with case studies, of the innovations in secondary physics, chemistry and biology was commissioned. The study resulted in the following conclusions: (i) textbooks play a dominant role, (ii) textbooks with assignments in real-life situations (contexts) are rarely used, (iii) context-based modes of treatment of the subject matter are rare, (iv) experiments are conducted more often in chemistry than in physics and biology, (v) whole-class instruction is the dominant (non-participatory) mode of instruction (Kuiper 1993).

Recently the Ministry of Education in the Netherlands commissioned two studies into curriculum innovation. The first study concerned mathematics, physics, chemistry and biology (Terwel, Volman and Vermeulen, 1996). The second was focused on language education (Withagen, Oud-de Glas, Smeets and Buis (1996). Both studies constitute theoretical and experimental curriculum studies in secondary education in the Netherlands and cover the last three to four decades of curriculum innovation. Data were derived from research literature, interviews and document analysis. The impetus for these studies was an expressed supposition by the Dutch Ministry of Education to the effect that curriculum innovation in most subjects might not be as successful as in mathematics. In order to test this supposition and to develop some insight into the reasons for this supposed situation a study was considered desirable. The studies were designed with the purpose of exploring the state of the curriculum innovations.

In (foreign) language education the most important innovation of the last decades has been a shift from a grammatical-structural to a communicative approach, in which authentic situations and texts play a central role. This can be recognized in all language curriculums. Attempts are made to situate language learning in the daily life of the students. Modern methods in language teaching rely less heavily on knowledge of linguistic structure and more on the use of language in communicative situations. Learners are required to speak in the foreign language and, where possible, to communicate with native speakers. The emphasis is on new methods, such as listening to radio broadcasts in the foreign language, watching and discussing foreign television programs, and writing letters in the target language. Topics from other subject areas are also part of the process (see also Van Essen (1990; Van Els & Buis, 1987; Ervin 1989).

Broadly speaking, the same developments are found in mathematics, physics, chemistry and biology. There has been a development from the transmission of the 'structure of the discipline' toward the development of physics, chemistry and biology in 'realistic situations'. Mathematics takes a somewhat different position in this development. From a historical perspective conclusions about the nature of the innovations in mathematics in the Netherlands show a unique development of this subject in secondary education. From 1960-1995, a constant set of 'European cognitivist and constructivist' ideas was at the source of the innovations in the Dutch mathematics curriculum, while at the same time ideas such as 'new math' , 'structure of the discipline' and 'mastery learning' have been ignored. There have been strongly held, detailed views on the teaching of mathematics: 'mathematics as a human

activity', 're-invention', 'realistic mathematics education' and 'mathematics for all'. Moreover, factors known from innovation-theoretical research have been helpful in implementing these views, especially 'developmental research' and the stimulating role of Hans Freudenthal (1973, 1991).

The assumption that innovation in mathematics has been more successful cannot receive definite confirmation, although mathematics education in the Netherlands has undoubtedly been a kind of Mecca, also for scholars from other countries. But the success of the innovation in mathematics must be qualified; first, because differences in success were also found for the other subjects, and, secondly, because the success of the innovation in mathematics itself may be questioned. Mathematics has to prove itself on the operational level, and the implementation of the innovation still has not been completed. In this respect mathematics is very much like other subjects. However, it is the success of mathematics on the ideal and formal level that can be seen as an important factor in the positive image with which innovation in mathematics is viewed; after all the formal level (exams and curriculum materials) is the most visible level. In spite of these qualifications all respondents spoke positively about innovation in mathematics.

Intervention studies

Experimental data about the processes in classrooms and learning results are scarce. However, there are well documented intervention studies in language and math education in the Netherlands. By way of illustration some examples are presented from Dutch research projects in mathematics and language education. These projects are relevant for the innovation of the national curriculum.

Attempts to achieve greater authenticity and in-depth understanding of mathematical concepts and structures can be found in mathematics education. A research group around Jan Terwel in the Netherlands has been involved in a series of projects for more than 15 years. The results of three of these projects are summarized. In all projects a pretest-posttest control group design was used. The number of students in the various projects was from about 400 to 800. The experiments were conducted in real school settings.

The first project was entitled 'ID 12-16', a Dutch acronym for 'Mixed Ability Teaching in Mathematics for 12-to-16-years old'. A mathematics curriculum, based on the ideas of Freudenthal, was developed by the SLO (The Dutch National Institute for Curriculum Development). The main characteristics of the curriculum are learning in real-life contexts and learning in small cooperative groups. The outcomes of the study show that students in the experimental groups outperformed the students in the control group (effect size .22). However, indications were found that low-achieving students profit less from cooperative learning than high-achieving students (Terwel, 1990; Van den Eeden and Terwel, 1994).

The second project was entitled 'AGO 12-16', a Dutch acronym for 'Adaptive Instruction and Cooperative Learning in Mathematics for 12-to-16-years old'. An instructional model (AGO-model) was developed, in which whole class instruction, learning in small cooperative groups and individual work was combined. This model can be described as a whole-class model that allows for student diversity through ad hoc remediation and enrichment with-small groups on a daily basis. The AGO-model consists of the following stages:

- Whole-class introduction of a mathematics topic in real-life contexts;
- Small-group cooperation in heterogeneous groups of four students;
- Teacher assessments: diagnostic test and observations;
- Alternative learning paths depending on assessments consisting of two different modes of activity:
  a) individual work at individual pace and level (enrichment), in heterogeneous groups with the possibility of consulting other students;
  b) opportunity to work in a remedial group (scaffolding) under direct guidance and

super vision of the teacher;
- Individual work at own level in heterogeneous groups with possibilities for students to help each other.
- Whole class reflection and evaluation of the topic;
- Final test.

The model provided for diagnostic procedures and special instruction and guidance by the teacher in a small remedial group for low-achieving students. In this second project an effect size of .68 was found. However, indications were also found that low-achieving students profit less from learning in small groups than high-achieving students (Terwel, Herfs, Mertens and Perrenet, 1994).

In the third project, entitled 'Social and cognitive strategies in mathematics 12-16', the AGO-model was again used as a point of departure. Special training was given to students in the use of social and cognitive strategies for problem solving from real-life contexts in cooperative groups. Special attention was given to the analysis of differential effects for high- and low-achieving students. The focus on differential effects was derived from research into learning in small cooperative groups and from the results of meta-analyses into the effects of training in learning strategies. From these intervention studies we may conclude that, in general, these programs contribute to learning. However, it seems that low-achieving students are unable to benefit from interventions of this kind (cooperative learning and training in learning strategies). The overarching question is whether it is possible to design an instructional program in which all students benefit and in which the low-achieving students profit more than their counterparts in the control-program. The outcomes of the investigation clearly show the effects of the intervention. Teaching students how to use strategies has the expected, positive effects (effect size .52). In addition to this main effect the differential effect is mitigated in a more egalitarian direction. The low-achieving students in the experimental condition outperformed their counterparts in the control group. To put it differently, the special training and the special remedial instruction of low-achieving students provided a compensating effect (Terwel, Hoek and van den Eeden, 1995; Hoek, Terwel and van den Eeden, 1996).

In language education there has also been a growing interest in real-life learning strategies. De Glopper, Van Daalen-Kapteijns and Schouten-van Parreren (1996) conducted an experiment into the effects of training word learning strategies from authentic mother tongue texts. The quantitative effects were measured with paper-and-pencil tests, whereas the qualitative effects were assessed in a thinking-aloud sequel. In this small-scale, random experiment an effect size of .2 for the paper-and-pencil-test was found, which was not significant. However, the analysis of the think- aloud protocols clearly revealed a positive effect. In contrast to the untrained students, the trained students more often used elements of the strategy to derive word meanings from contexts.

The general conclusion is that characteristics of the experimental programs in language and mathematics produced positive outcomes (through the use of real-life situations and learning in small cooperative groups). Recently there has been an emphasis on strategic learning from contexts. The promotion of learning from real life contexts by training in the use of strategies seems to be an attractive avenue for further development and research in languages and mathematics within the context of the national curriculum.

These experiences and conclusions are in line with studies in the United States of America, for example, Schoenfeld and Lampert in: Collins, Brown & Newman (1985), The Vanderbilt & Cognition Group (1990) the 'Fostering Communities of Learners' project of Brown & Campione (1994), the research and development group around Scardamalia (Scardamalia, Bereiter, McLean, Swallow & Woodruff (1989), and the project, entitled 'Schools for Thought' (Lamon, 1995).

Characteristics of authentic pedagogy

We will try to summarize the main characteristics of authentic pedagogy from the exploration of theoretical, practical and experimental sources outlined above. First, a description will be given of the practical and theoretical applications of the concept 'authentic pedagogy', followed by a formulation of an operational definition in the context of research.

Conceptualization in the context of pedagogy

Within the framework of authentic pedagogy there are concepts which are strongly related to, or sometimes even based on, ideas from pedagogical reform movements, situated learning and constructivism. The most important of these are: the meaningfulness of the learning context, the connection between learning and behavior, knowledge as a tool rather than as a goal in itself, the significance of the interaction between learners, the influence of cultural attitudes, the idea of the learner as an active researcher, less emphasis on the teaching of facts, greater emphasis on the personal aspects of knowledge, more attention to coherent forms of knowledge as well as greater emphasis on the way in which the learner arrives at a solution, more focus on the complex problems which learners (re)structure for themselves, application of the 're-invention' principle and the acceptance of more than one solution to an existing problem. Teaching can be shaped on the basis of some or several of these characteristics, resulting in characteristics which do not follow the traditional pattern; one of the most striking being the changing task of the teacher.

Conceptualization in the context of research

In the context of research into curriculum, teaching and learning it is desirable to provide clear delimitations of the concept 'authentic pedagogy'. In our view, this concept has implications for three main components of teaching: types of instruction, quality of academic tasks, and types of assessment. It is not the case that education is either authentic or non-authentic. Authenticity is always a matter of degree, depending on the demonstrability of the associated characteristics.

Newman, Marks and Gamoran (1995, 1996) distinguish three standards of authentic performance, from which they arrive at standards for instruction and (assessment) tasks. First, construction of knowledge requiring organization of knowledge and higher-order thinking. Second, disciplined inquiry, asking students to develop deep disciplinary knowledge and to use processes common to disciplinary inquiry such as elaborated communication. Third, value beyond school, which means that students make connections between substantive knowledge and either public problems or personal experiences.

In the present study we have adapted these characteristics (Roelofs, Franssen & Grootscholten 1996) slightly. In our view "value beyond school" should be divided into two parts: personal value or 'connectedness to the students' personal worlds, and value for the professional world. The latter relates to what psychologists call the 'culture of practice'. In addition, we added 'in complete task environments' to the characteristic 'construction of knowledge', since that is what situationists and constructivists emphasize when they talk about knowledge building. In the American projects mentioned above we can recognize this aspect of meaningful, complete tasks very clearly.

We will not mention disciplined inquiry as a discrete characteristic of authentic pedagogy. This is subsumed under 'construction of knowledge in complete task environments' and under a different characteristic which we call 'communication and cooperation'. By the characteristic 'communication and cooperation' we mean the typical ways in which knowledge users interact about knowledge'; that is, by means of conversation, negotiation, and cooperation. In short, four aspects of authentic pedagogy can be distinguished: construction of knowledge in complete task environments, connectedness to students' personal worlds, value beyond school,

communication and cooperation.

The implementation of authentic pedagogy is dependent on several factors, including changes in the classroom climate, the role of technology and democratic decision procedures. King (1995) suggests that teachers at schools with shared power relations are more easily prepared to stimulate the quality of learning in the direction of greater authenticity. The changeover to greater authenticity entails a drastic change and is therefore difficult to implement (Newmann et al. 1995; Kuiper 1993; Van Essen 1990).

Authentic pedagogy also requires different methods of assessment. The idea of ultimate achievement gives way to image formation in relation to the development and growth of learners (Fischer & King 1995; Hart 1994). Student portfolios should be useful in this connection. They provide an opportunity for richer, more authentic, and more valid assessment of student achievement (Calfee & Perfumo, 1993).

Research questions

In this central part of our paper, an overview is given of an extensive, multiple case study on the implementation of authentic pedagogy in three large Dutch secondary schools.

The following questions are addressed:

According to teachers' and students' perceptions, to what extent are characteristics of authentic pedagogy applied in the first grades of Dutch primary education, respectively one year and three years after the implementation of the national curriculum? To what extent does text book use reflect characteristics of authentic pedagogy? To what extent are conditions for authentic pedagogy met?

Research Methods

During three school years in the period from 1993 up to 1996, three large schools (between 1000 and 1400 students) were subjected to an in-depth inquiry. These schools were expected to implement the state mandated innovations in the 1993-1994 core curriculum.

Instruments

Authentic pedagogy was operationalized by means of the four characteristics mentioned earlier: construction of knowledge in complete task environments, connection to the students' personal worlds, attention to the value of learning situations beyond the school, and cooperation and communication.

Three indicators for authentic pedagogy were used. First a situation-specific questionnaire for teachers; second, two situation-specific student questionnaires for math and English; third, data from classroom observations and interviews on teacher text-book use. All instruments covered the four characteristics of authentic pedagogy.

The teacher questionnaire addressed opinions, intentions, and reported teacher behavior with regard to authentic pedagogy characteristics. The questionnaire contained three sections: The first section starts with a short description of a learning situation, in which the characteristics of authentic pedagogy are visible (from a researchers point of view). The questions concern the instructional processes in which teachers engage, (homework) assignments, and the way learning outcomes are assessed. Responses to the questions are given on a six-point scale (1=never/fully disagree, 6= always/fully agree). Within each characteristic the questions make up one scale. Data on scale items and scale reliability are displayed in table 2. Typical activities with reference to 'Construction of knowledge' include:

use of tasks with different possible solutions'; giving open-ended assignments, accompanied with criteria about the products; independent collection of information by students. 'Connection to students' personal worlds' refer to activities like: analyzing students' experiences when introducing new content, choosing lesson topics from the students' personal worlds; possibilities to talk and write about subject-related personal experiences. 'Value beyond school' is reflected in the following types of activities: attention to recent developments in society; media (newspaper, t.v., radio) use; assignments addressing societal problems; presenting results to out-of-school experts. 'Cooperation and communication' refers to activities like: having students work together in groups on collective tasks; teacher acting as a facilitator; students playing an important role in assessing the results of collective tasks.

Teachers were also asked about the conditions for authentic pedagogy and about their problems in implementing authentic pedagogy. The following subjects were covered: suitability of text book to design open-ended tasks; possibilities for using different media (newspaper, radio, t.v)'; support on school level (flexible time table, cooperation between subject departments)'; feasibility of AP with regards to student characteristics.

A second situation-specific questionnaire on English and Math was developed for the students. The questions concern students' perceptions of teaching behavior. Preliminary to each question a classroom situation of an imaginary student was presented which largely corresponds to the four characteristics of authentic pedagogy. Subsequently the student indicated the frequency of the presented teaching activity in his or her own classroom. Former versions of the final questionnaires were talked through with three target group students (age 12-15) and their teachers. Criteria for revision were readability of the descriptive texts and difficulty level of the question asked. Examples of different questions are: 'Do you ever start learning activities without an assignment from your teacher?' 'Do you also get complex tasks that require you to put different pieces of information together?' The student can respond on a five-point scale, from 1 ('never') to 5 ('very often'). Both questionnaires make up one scale, labeled 'authentic pedagogy' . Data on the scale are presented in table 3.

In addition to the questionnaires nine math and English teachers were interviewed about their daily textbook use. First, the teacher was confronted with a short transcription of his assignment practice, as a starter for the interview. In addition, aspects of daily textbook use were addressed, representing all four characteristics of authentic pedagogy. Teachers were asked to what extent they took measures to support authentic pedagogy. They were also asked about their own opinions and motives with respect to teaching English and math according to standards of authentic pedagogy and the role of the text book used.

Research situation and sample

Teachers and students from three large secondary schools in the Netherlands took part in the study. The school are different in size and use different policies of assigning students to classes. In school A students are assigned to completely heterogeneous classes, based on the expected level of secondary education to be followed. The school is situated in a socially deprived area, riddled with social problems, and has a relatively large amount (10%) of non-native speakers within its population of 1400 students. In school B the student population (1000 students) consists completely of native speakers of Dutch. In the first year students are placed in intermediate heterogeneous classes: students of a given expected level and of the level next above were placed in one class. In school C students from one expected level were placed in one class, in 1996, however, students were also placed in intermediate heterogeneous classes. In addition, schools differed in their religious identity.

A total of, respectively, 254 and 317 teachers participated in the teacher survey in 1994 and 1996. The teacher questionnaire was administered to the complete teaching staffs of all the three participating schools. The response percentages for school A were 20% in 1994 and 36% in 1996. For school B these were 71% and 79% respectively. For school C the

percentages were 84% in 1994 and 90% in 1996. Reasons for not returning the questionnaires were: difficult questions, distance between the questions and reality, lack of time.

In 1994 half of the first grade students received the mathematics questionnaire (n=442), the remaining half the English questionnaire (n=464). In 1996 first up to third grade received questionnaires (n=1014), half of them on English, half of them on math (n=930).

In the fall of school year 1994-1995 nine teachers were visited and interviewed by research assistants.

Analyses

Only those teachers were selected for analysis who teach in the first stage of secondary education, thus implementing the national curriculum for this stage, and who completed both the 1994 and the 1996 questionnaires (n=89). Changes in the reported behavior within schools were analyzed with t-tests for paired observations. Differences in changes between schools were analyzed with variance-analyses of difference scores, with school as a factor.

Students' perceptions of their teacher's teaching behavior was based on data from the first to the third grade. Differences between schools were tested by means of a one-way analysis of variance on the data of two school years, with school (A, B and C) as a factor. Changes over the two school years and between schools were tested with a two-way analysis of variance on the grade-one data, with research year (1994 and 1996) and school (A, B and C) as factors.

In order to determine the relation between teacher and student perceptions all data from the first and second research years were pooled. The data from the second and third grades (relating to 1996) were also included in the analysis. First, the class means were calculated for the student questionnaire scores for English and math. These are the scale scores for 'authentic pedagogy' (English, 22 items α=.78, math 21 items α =.77). In this way more class averages per teacher would be created, depending on the number of classes which completed the questionnaire for a given teacher. Subsequently each set of class scores was related to a corresponding teacher score on the teacher questionnaire. These latter scores are the total scale scores for 'authentic pedagogy' (48 items,α=.91). Product-moment correlations were computed between student scores and teacher scores for authentic pedagogy on the whole.

All statements from the interviews on text book use were transcribed, coded and counted on the basis of the Miles and Huberman (1994) method. Questionnaire data from teachers and students and interview data about teachers textbook use were combined, to allow triangulation of conclusions.

Results

Part 1. Teacher perceptions of authentic pedagogy

Table 1 presents the data for the four scales of authentic pedagogy as perceived by the teachers. In the description below we will also comment on the various items that comprise the scales. However, individual item means will not be presented for reasons of economy.

Table 1 here

In general the results show that knowledge construction on the whole takes place only occasionally (means 3.3 and 3.4 for 1994 and 1996 respectively). Teachers undertake some

activities characteristic for knowledge construction. These largely concern the activation of the students' thought processes: using scaffolds instead of complete answers in case of students questions, using student expertise, and focusing on the whys and wherefores of solution processes. Teachers attach greater importance to the way a solution has been arrived at than to its correctness. However, verbalization of the way in which the solution to a problem is takes place only occasionally. This is a striking result in view of the importance the teachers attach to their students knowing how a solution can be arrived at and why a solution is correct. It is possible that time limitations play a role in this process, leading to situations in which the teachers themselves take the responsibility for the verbalization of thought processes.

The learning situation does not contain complex or complete assignments with integrated forms of subject content. Teachers rarely ask for research activities, during which connections are made with other subjects. Independent collection of information by students is not clearly indicated. Neither the instruction process nor the assignments and assessment procedures make use of integrated tasks.

Between 1994 and 1996 no large shifts in perceived teaching behavior could be observed. For school A a stronger orientation was found toward the 'construction of knowledge in complete task environments' than for schools B and C, although a significant increase in this respect can be observed for school C.

On average the teachers endorse the importance of *relating to students' personal worlds.* Measures to achieve this are taken rather frequently (means 3.6 both in 1994 and in 1996). A closer inspection of the item means revealed that what matters is how far teachers are prepared to go in this respect.

In the clarification of instructional content teachers often choose examples from daily life. According to the teachers students also very often have space to discuss their own experiences in relation to the subject. The teachers' choice of subjects for their lessons taken from daily life is somewhat less frequent. The choice of problems related to daily life ranges from occasional to frequent. Slightly less frequent are teachers' choices of subjects in which students take a personal interest. Teachers occasionally analyze student experiences of daily life by introducing new subjects. The same holds for giving students space to express their personal opinions in the context of controversial problems. Teachers' choices of (homework) assignments which are directly related to daily life are rare. Situations in which students have a say in determining the lesson content occur very rarely according to the teachers at the three schools.

By and large there are few changes during the implementation of the core curriculum as far as the process of relating teaching to students worlds is concerned. Differences between teacher scores for the three schools are non-significant in 1994 and 1996.

Teachers occasionally pay attention to the *relevance of learning beyond school*, given the average score of 3.0 on the corresponding subscale. Returning to the individual items, here too we notice that the more drastic the measures, the less they are applied. For example, on average there is regular attention to current developments in society as well as to the relevance of subject matter to professional contexts and daily life. By contrast, media are only sparingly used in those instructional processes which deal with professional situations and current developments. The most extreme way of focusing on out-of-school applications involves tasks which deal with social problems, from which the results are subsequently submitted to a person or an institution outside the school (item 40). This type of practice is extremely rare.

A comparison between schools for the years 1994 and 1996 shows that school B paid most attention to the relevance of instruction to out-of-school situations (1996: F=6.1, df=2.85; p=.00). The differences between the schools remain the same in 1996. These differences are explained mainly by the increased attention at school B to media and professional situations. The relative lack of focus on media at school C (mean. 2.4) can be

explained by the religious identity of the school, which discourages the use of certain media (television in particular).

The fourth aspect of authentic pedagogy, 'cooperation and communication', does not yield a general picture for the three schools, since the differences between school A on the one hand and schools B and C on the other are too great. Both in 1994 and 1996 the learning situation at school A is more often characterized by 'cooperation and communication' (mean 3.9) compared with the other schools (1996: F=5.9, df=2,85, p=.01).
At school A cooperation in groups occurs fairly frequently, with teachers acting as background facilitators. Assessments of the results of group processes are, according to the teachers, to a fairly large extent the result of consultations between the teacher and the students. However, monitoring of group work progress occurs much less often as a student task than might be expected. Also, interdependence is created only sparingly in group work, contrary to what might be expected for cooperative learning. This lack of interdependence is even greater for the other schools.

As mentioned earlier, there is less cooperation and communication at schools B and C. Where it exists, the teacher's role is slightly more prominent than at school A. This is particularly true for school C, although this school does show an increase in cooperative learning (t= -2.2, df=41, p=.05). At school B students are given a more important role in the assessment of collective tasks. In other respects there is little change for schools A and B, and mutual differences remain.

Conditions for authentic pedagogy.

Teachers' actual teaching behavior is partly determined by the degree to which certain conditions are fulfilled. Table 2 provides a picture of the degree to which this is the case, especially for the support of authentic pedagogy.

Table 2 here

For a learning environment in which knowledge construction is to be supported, fulfillment of the necessary conditions is limited. First, the text book does not leave much room for providing students with problems which allow a maximum amount of freedom for their solutions. The instructional time-blocks are not considered long enough to enable the accomplishment of multi-reponse tasks. School facilities that enable students to collect information independently are available to a reasonable degree, according to teachers from school B. Teachers from school C are less satisfied in this respect (1996: F= 4.7, df= 2, 85, p= .01). Teachers from school A show less satisfaction in the course of two years (t=-2.8, df= 12, p= .02). The text book used offers the opportunity to choose subjects from the real world (item 35). Especially school B (mean 4.6), and to a lesser extent school A (mean 4.1), shows a fairly high degree of satisfaction in this respect. Less satisfaction is shown at school C (mean 3.7; 1996: F= 3.2, df= 2, 84, p= .04).

Possibilities for media-use make up an important condition when teachers wish to pay attention to the value of learning activities beyond school (item 49). There are significant differences between the schools in this respect (1996: F= 21.5, df= 2, 85, p= .00). In general these possibilities were regarded as limited and deteriorated further between 1994 and 1996 (t= 2.8, df= 84, p= .00). The latter is especially the case for school A (t= 2.2, df= 11, p= .05) and B (t=3.3, df= 31, p= .00). In 1994 school B teachers were relatively positive about possibilities of media-use.

Implementing authentic pedagogy requires supportive measures at school level, including the use of flexible time tables and cooperation between departments. In general teachers state

that forms of authentic pedagogy are not supported at school level. This situation remains unchanged over the two school years investigated.

Finally, teachers agree with the statement that lesson content and lesson design are highly dependent on the text book used. There was no change in this point of view during the period 1994-96.

The differences between schools B and C are significant. Four item scores differ significantly between the schools: the possibilities for media use, the amount of room for open-ended tasks in the text book, and school facilities for independent collection of information are all rated higher in school B than in C. Furthermore, teachers from school B are more inclined to say that the text book used encourages the choice of topics from everyday life.

Part 2: Student perceptions of authentic pedagogy.

Table 3 represents the results of the student questionnaires, relating to students in the first three grades in the period between 1994 and 1996. The data represent the mean scores on the total scale for authentic pedagogy for the subjects English and Math with alpha└= .78 and .77 respectively. With regard to composition, the scales are not completely parallel, since a subject-specific elaboration was made of the concept 'authentic pedagogy'.

Table 3 here

In general we may conclude that first to third-grade students do not characterize English classes as being oriented toward authentic pedagogy; according to our definition (means 2.1 both in '94 and in '96 for grade 1, see table 3). An examination of some important components yields the following picture. In teaching English teachers rarely use topics from different school subjects and students rarely start activities on their own initiative, fostering independent learning. Clearly students mainly carry out assignments set by the teacher. Complex assignments in which reading and writing are combined do occur, but very rarely. The students' own experiences and interests hardly play any role during the lessons. Students are hardly ever allowed to bring objects from home for use in the lesson (e.g. CDs). In addition, students report that assignments for an out-of-school audience almost never occur. Finally, students do not work on joint tasks on a frequent basis. (item 23).

With reference to math lessons, first to third-grade students again report that teachers rarely engage in authentic pedagogy (means 2.3 and 2.4 for 1994 and 1996). In general the picture of math lessons is not much more authentic than the one for English. On some aspects of authentic pedagogy, however, the item-scores for math lessons are higher than for English lessons. Students report that they sometimes perform complex assignments during math lessons, requiring combination of information, whereas students of English note such assignments only rarely. Another difference relates to the extent to which teachers use topics from different school subjects: the frequency of such inclusion is higher during math lessons than during English lessons. On the other hand, students more often report assignments with a real-life character than their peers do in math.

Both English and math lessons in grade 1 do not become much more authentic during the implementation of the national curriculum. Differences between schools are both significant for math and for English in 1993-1994 (F= 47.8, df= 2, 731, p= .00; df=2, 797, F=53.4, p= .00). Teachers from school A attain in both subjects higher scores for authentic pedagogy than their colleagues from schools B and C. In 1995-1996 we see that levels of authentic pedagogy vary across schools and grade level both for English and math. (F math=4.2, df=4, 921, p=.00; F engl.=4.4, df=4, 1005, p=.00).

Relationship between student perceptions and teacher perceptions

The correlation between the class means for authentic pedagogy on the student questionnaire and the corresponding teacher score on the teacher questionnaire is rather high for math (r=.76, p=.00, n=36). Clearly, differences between teachers as established by the teacher questionnaire are confirmed by the results for the student questionnaire. In comparing the mean scores on 'authentic pedagogy' we notice a difference between student judgments (table 3) and teacher judgments (table 1). Apart from the differences in the scales used (a five-point scale for students, a six-point scale for teachers), teachers appear to present a more positive picture of themselves than they receive from their own students.
The latter finding is also true for the English lessons. The teachers indicate a higher frequency of activities that can be characterized as authentic pedagogy. However, there is a zero correlation between the student questionnaire scores and the teacher questionnaire scores (r=.00; n=37).

Part 3: Text-book use

In our interviews aspects of daily textbook use were addressed, representing all four characteristics of authentic pedagogy. Below, the results of daily use are summarized.

Construction of knowledge

Both English and math classes can be characterized as providing practice in basic skills and strategies. Complete assignments and learning situations in which students have a say rarely occur in English or math textbooks. Learning situations requiring compensating strategies to overcome a lack of fluency in English occur infrequently. Math textbooks infrequently offer room for students to develop their own solution strategies to a mathematical problem, according to the teachers.

In explaining this teaching practice English and math teachers claim that first grade students and especially less able students benefit considerably from learning the basics, before being confronted with complete or complex tasks. In this respect they cover their text books. Another reason for not using complete tasks is lack of time, due to an already overloaded curriculum.

Moreover, English teachers do adapt their textbooks in one respect. Although grammar is not emphasized in the teaching of English, most teachers prefer to teach some basic grammar rules before starting to communicate. In this way they act conservatively compared to the central characteristic of modern textbooks, which is to use grammar only to support communication. Although complex tasks do not occur, there are indications that words and idioms are learned at least in the contexts of whole stories.

In math we notice an orientation to the school subject itself. Mathematical strategies and concepts are only occasionally connected to other school subjects.

All these findings show that in learning English and math one cannot speak of construction of knowledge in complete task environments, due to text book characteristics, the way text books are used and specific objections against knowledge construction.

Connectedness to students' personal world

In math the question was to what extent students can get a clear picture from learning situations in the textbook. The use of concrete imaginative materials is also part of connecting content to students' personal worlds. In addition possibilities for students to determine parts of

the lessons content is part of this aspect of authentic pedagogy.

Textbooks themselves and the way they are used do not in all respects reflect an orientation to students' personal worlds. Learning situations in math books are considered imaginative because of the inclusion of many real-life illustrations. Teachers do use these illustrations. However, they do not use concrete materials in their classes quite as often. Students do not have a say in determining the lesson content and procedure, beyond what is planned in the text book. Moreover, teachers regard this as undesirable in the first grade because of the overloaded curriculum.

In English classes students should recognize English from their own daily experience (e.g. t.v., computers). Beyond that students should be allowed to read, write, and speak on their own purpose. English textbooks do not offer room for students' initiatives. Teachers stick to their books in that respect. They also complain about a lack of books in the school library. In addition they say that students have to master basic reading and writing skills before they can be given freedom in choosing material for listening, speaking, reading, and writing. Teachers sometimes make use of English from the school environment, mainly by telling anecdotes form out of schools. Objections against addressing students' personal world are: The changing nature of this world, differences between students, lack of quality of (text) materials taken from home, "students should transcend their own world".
In sum, for many reasons teachers are not willing or able to take students' worlds into account, beyond what is already addressed in the text books.

Value of learning activities beyond school

Relevance of learning English and math for situations beyond school can be expressed in the perceived usefulness of learning situations in the text books. Beyond that, in learning to communicate in English, students should fulfill real communicative needs, such as bridging information gaps. Also important is attention to language use in English speaking countries, or to out-of-school users of math.

We notice a difference between the two subjects. English teachers are more satisfied about the usefulness of learning situations than math teachers. Everyday use of English is pictured adequately in text books, according to teachers, although only British English is used.

Teachers from school A take initiatives to make math more useful, including a project on integrating school subjects. Teachers from schools B and C do not take these initiatives. Most teachers in the three schools use examples from daily life to explain basic knowledge. Some doubt the importance of relating to the world outside on the supposition that the use of many contexts could be confusing for students.

Complete authenticity in communication would mean that students could have direct face to face contact with English speaking people. Teachers were not asked to comment on this. We only looked at text book situations. When asked to communicate in text book situations students are rarely asked to meet a real communicative need.

We may conclude that relevance of learning for out-of- school situations is addressed as far as the textbooks permit. Except for school A, teachers do not go beyond their text books.

Cooperation and communication

Teachers were asked if they used learning situations in which students are dependent on one another to achieve learning goals.

In English one can to some extent speak of mutual dependence. Students practice English expressions and short conversations in pairs, as planned in the textbook and student workbook. According to most math teachers textbooks offer little room for cooperation

between students. Both in English and in math classes students are *allowed* to discuss answers to individual assignments with class mates. In that sense one can speak of communication of knowledge.

Teachers from school A encourage their students to help one another, especially when teacher advice is not available. Teachers do so by creating groups and communicating rules for giving and receiving help. These teachers sometimes change text book assignments in such a way that students become mutually dependent, including inviting class mates for a party that was really given. In schools B and C none of these measures are taken. On the contrary, they sometimes replace mutual oral exchange of information by mutual reading aloud written sentences, prepared in advance. Teachers indicated that they want their students to learn and practice standard English expressions, which they can use in the future.

Teachers mention certain conditions for collaborative learning situations that are usually not met: Social skills, sound classroom management, availability of a partner, a joint task, division of tasks.

In sum we can conclude, that in school A the use of text books reflects to some extent a climate of cooperation and communication, whereas this is hardly the case in B and C .

Conclusions and discussion.

We may conclude from the results of this research that, in the context of the national curriculum for the first stage of Dutch secondary education, the characteristics of authentic pedagogy were not observed to a satisfactory extent. This finding matches data presented by Newmann, Marks & Gamoran (1995, 1996), which indicate that authentic pedagogy characteristics were observed for a very small minority of the 24 United States schools investigated. In this respect the ideas and developments instigated by a small enthusiastic group of subject specialists, curriculum developers, teacher educators and supervisors seem to be far ahead of reality. Our conclusions are in line with the above-mentioned Dutch studies of Kuiper (1993), Terwel, Vermeulen and Volman (1996) and Withagen, Oud-de Glas, Smeets and Buis (1996).

Even the assumption that innovation in mathematics has been more successful could not be proven in full. The inspiring work of Freudenthal, who can be seen as a proponent of authentic pedagogy before his time has apparently not resulted in major innovations at the operational level in all schools in the Netherlands. However, in this respect two positive results can be mentioned. First, positive effects on processes and learning outcomes were found in intervention studies into authentic pedagogy in secondary mathematics (Terwel, 1990; Terwel, Herfs, Mertens and Perrenet, 1994). Second, the IEA-studies (TIMSS) show that Dutch students perform rather well, but indications that allow us to attribute these results to the 'realistic math and science movement' in the Netherlands are scarce.

One of the striking results is that, as far as authentic pedagogy is concerned, students are less positive about their teachers than the teachers themselves. Whereas teachers indicate that they practice certain aspects of authentic pedagogy regularly or often, the students indicate that teachers do so infrequently or very infrequently. It is possible that teachers indicate a higher frequency because they total their activities for all classes, whereas students focus on one class per teacher. Another possibility is that teachers and students have different conceptions regarding aspects such as everyday life and value beyond school. What is regarded by teachers as part of everyday life may turn out to be alien to students. With regard to the pictures of differences between schools there is mutual confirmation between the two data sources.

Returning to the question of authentic pedagogy characteristics we may draw the following conclusions. There are indications that teachers create learning situations which can be characterized in terms of *knowledge construction*. Teachers themselves claim that they use student expertise and encourage students in finding solutions of their own. However, in text

book use this is rarely the case. According to the teachers, attention during learning tasks is often focused on solution processes. On the other hand, individual student research, reports of findings and integration of instructional content in short *complete task environments* are rare, partly due to the text book used. As mentioned before, in regard to math or English lessons students only rarely recognize situations in which their teachers try to encourage them to construct knowledge. According to the students integration of knowledge elements from several subjects is practically non-existent. Data on text book use for English confirm these findings: these teachers tend to concentrate on teaching basic skills, not on integrating such skills

From the teachers' point of view a somewhat more positive picture emerges in relation to the *connection of learning to students' personal worlds*. Teachers are prepared to take measures insofar as these fit in with the text book. In the explanation of instructional content examples from the everyday life of the students are included and also added to the textbook. However, they frequently stick to their text books and are not inclined to use the students' own experiences. Greater student contributions to the lessons based on everyday life are realized to a lesser extent. Here too the difference with student perceptions is notable. According to the students everyday life features in the lessons in very limited ways, also in the clarification of instructional content. As stated before there may be clear differences of views concerning the real world between teachers and students.

In regard to the *relevance of learning to situations beyond the school* we notice that the more far-reaching the measures are, the less they are applied. Fairly regular attention is paid, according to the teachers, to current developments in society, as well as to the relevance of instructional content to professional and real-life situations. The most far-reaching method of focusing on out-of-school application is the assigning of tasks which involve some kinds of social problems, where the solutions are subsequently submitted to an outside institution or person. This is hardly ever the case, partly because teaching has to transcend the text books, which may consume time in an already overloaded curriculum. Contacts with outside professionals are practically non-existent. Only very rarely are authentic media (such as radio, newspapers or television) used as teaching aids in the teaching and learning process. Again, the students' views are even less positive in this respect.

The fourth characteristic of authentic pedagogy, *cooperation and communication*, can be observed in teaching practice to different degrees. As regards cooperation between students school A shows clear initiatives. This is much less the case for the other schools. In particular, tasks involving mutual dependence are very rare, as seen both in the questionnaire data and in the data on text book use. Aspects of communication which include presenting each other with the results of learning assignments or the joint performing of roles which mirror social roles occur occasionally. Knowledge is clearly not often viewed as the product of mutual communication and negotiation at the three schools. Again, students less often recognize elements of cooperation and communication during the lessons than their teachers do.

In general there are differences between the three schools, although these are not striking. On the authentic-formal/traditional dimension school C is closest to a traditional learning environment, while school A lies slightly more in the direction of authentic pedagogy. For most characteristics school B occupies a middle position, except for the value-beyond-school characteristic.

A comparison between the years 1994 and 1996 shows that there were few changes in the degree to which teachers achieve authentic pedagogy characteristics.

The less than wholehearted pursuit of authentic pedagogy is understandable. Authentic pedagogy requires school organizations to fulfill certain conditions. According to the teachers the degree to which such conditions are met is either limited or low. For example, it is desirable to make scheduling adjustments, including the use of extended instructional time blocks, in order to reserve time for cross-disciplinary activities. School B maintains a 50

minute schedule, while school A even reduces teaching periods to 45 minutes. It is conceivable that the implementation of the type of scheduling adjustments required could be hampered by contractual considerations.

Other obstacles exist in the form of teaching resources and text books. Teachers indicated that their lessons are strongly guided by the text books used. The question is how far existing text books are based on proposed forms of authentic pedagogy. According to the teachers this is the case to a limited extent. How flexible are text books in the way they relate current social developments or students' personal worlds to the learning situation? Here we are confronted with the problem that the real world as seen by the designers of teaching aids does not necessarily coincide with the real world of the students. Media such as television, CD-ROM, interactive programs such as E-mail and 'C-Sile' could offer more perspectives towards a more flexible use of current developments. Such media are insufficiently available at the schools examined. This is generally true for the Netherlands. There are various interrelated reasons for this state of affairs. First, there is a general lack of hardware and courseware at schools. This is one of the reasons why the modern media have not been sufficiently integrated into the total curricular program. It also appears that teachers fail to appreciate the increased usefulness that modern media might provide (Kleis Jager 1996; Bronkhorst & Rouwen 1996).

In addition, learning tasks supposed to have value beyond the school presuppose contacts with external institutions, which are difficult to realize in practice. In the 'Fostering Communities of Learners' program (Campione, Shapiro & Brown 1995) such contacts are effected by the use of E-mail links between students and outside experts (e.g. biologists). Contacts of this kind are as yet unknown at the schools investigated, but they raise the following question: Who would be responsible for such contacts, the individual teacher, the department? Learning by means of complex tasks requires collaboration between various subject departments, as well as support at school level.

This brings us to the limitations of authentic pedagogy. Teaching large numbers of separate subjects, each with their own program, hinders authentic pedagogy. Present forms of teaching require control and efficient management. The way Dutch schools are organized reflects these needs: separate classrooms for each subject; short lessons, followed by homework checked in subsequent lessons; strict limitations on time-consuming contacts with the outside world. As long as this situation prevails the implementation of authentic pedagogy will remain problematic. The situation might change the moment "authentic learning outcomes" (Newmann, Marks & Gamoran, 1995, 1996) are incorporated as *goals* aimed for in schools.

Finally, there remains the question of whether all the characteristics of authentic pedagogy should be included at all times during the teaching-learning process. One of these is students' initiatives in constructing knowledge. There may be educational and psychological reasons to refrain from complex learning environments that strongly incorporate discovery learning, re-invention and self-regulated learning. Here we arrive at the very heart of the question whether learning should take place top-down or bottom-up, deductive or inductive, formal or informal, and whether it should concentrate on the structure of the discipline or on authentic situations/contexts; on transmission or construction.

Although we do not share the position of Anderson, Reder and Simon (1996a; 1996b), who strongly reject constructivism and situated learning without noticing the limitations of the information-processing as an incomplete framework in which learning is viewed as a passive, atomistic, and mechanical process (Mayer, 1996). We also do not feel comfortable with the idea behind radical constructivists' that knowledge can only be constructed by the student, that learning can only happen in complex situations and that transmission by the teacher is impossible. Although constructivism undoubtedly has a valuable contribution to make to curriculum innovation, we may feel a little uneasy at the thought that so many subject matter specialists and curriculum designers almost uncritically seem to embrace a form of

'radical constructivism'.

On the basis of our own research, inspired by the work of Mayer (1996) but also by the present results, we are searching for a third, more practical option. In this third way there is no dogmatic rejection of bottom-up or top-down approaches. In accentuating the strategic aspects of teaching and learning from 'real life contexts' we can overcome this dichotomy. In this option the process may start from the "bottom" of the real life world and proceeds by designing intermediate models toward more formal structures and concepts. This is a process of modeling in which teachers play a central and guiding role. Teachers are cognitive guides as well as role models, and students are sense makers. In this view instructional models and strategies such as a combination of whole class instruction, discussion methods, guided reinvention methods, and supervised participation in meaningful academic tasks, and working in cooperative groups are recommended. There are moments when it may be necessary to provide more guidance to students who do not have sufficient prior knowledge or the required skills and meta-cognitive strategies. In our interviews, teachers indicated that some students lack these prerequisites. In such cases the teacher can conduct the role of expert and provide scaffolding for those students who cannot cope with a given task independently. If such student needs are ignored, friction is created between offered guidance and needed guidance (Simons in: Lowyck & Verloop 1995).

We are led to the conclusion that the school of the future is faced with the task of creatively combining traditional forms of education with authentic pedagogy. This implies a high degree of flexibility and the courage to explore new ways of teaching. Experiments based on sound principles of educational psychology would seem to constitute the most obvious instruments of progress in this respect. As regards further research, it would be interesting to investigate which elements of authentic pedagogy are capable of realization and under which conditions this might be the case.

Some methodological problems.

In conclusion we would like to indicate some methodological problems which could threaten the validity and reliability of this multiple case study.

In view of the low response percentage at school A in regard to the teacher questionnaire we have to place some question marks against the representative nature of the picture obtained for this particular school. Also, the overall means obtained are strongly distorted by the unequal numbers within the schools. In view of the small number of schools the results cannot be generalized to the entire Dutch population. However, it should be pointed out that our results are confirmed by other investigations (Kuiper, 1993; Terwel, Vermeulen and Volman, 1996; Withagen, Oud-de Glas, Smeets and Buis, 1996; Newmann et al. 1995).

Another problem lies in the fact that the practices of authentic pedagogy were to some extent examined on the basis of an ideal set by views of the researchers. A different method could have involved the mapping of the teachers' own views on teaching and learning and the way in which these views reflect authentic pedagogy. However, we opted for an elaboration of the characteristics of authentic pedagogy for three data sources: teacher and student questionnaires about teaching and learning activities and interviews on text book use. This ensured the possibility of triangulation, and the use of a uniform terminology. Also measurements can easily be repeated.

It is possible that the observed difference in perception between teachers and students lies in the nature of the testing instruments. For teacher and student questionnaires different scales were used, each with different scalar intervals. It would seem advisable in future to harmonize the scales in this respect.

Finally, it must be kept in mind that the main study reported in this paper was a descriptive one. No interventions from the part of researchers or curriculum developers were

implemented. The research described the innovation as seen trough the eyes of the teachers and students. It turned out that the changes in practice were very modest and no data about the effects of learning are available. However, from the intervention studies as described in the section 'Experimental background', it is concluded that aspects of authentic pedagogy, if adequately developed and supported, can be implemented and can result in significant learning gains. Comparing the results from the present descriptive case study and the earlier Dutch intervention study we learn that changes in classroom processes can be accelerated by providing teachers and students with experimental curriculum materials and by giving support through training in the use of strategies.

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Table 1: Implementation of characteristics of authentic pedagogy (means and standard deviations)

	Total (n=89)		School A (n=13)		School B (n=34)		School C (n=42)	
Scale and item number	'94	'96	'94	'96	'94	'96	'94	'96
Authentic pedagogy (48 items, α=.91)								
Construction of knowledge in complete task environments (15 items, α = .78)	3.3 (0.6)	3.4 (0.5)	3.6 (0.5)	3.5 (0.5)	3.4 (0.4)	3.4 (0.4)	3.2 (0.6)	3.3 (0.7)
Connection to students' personal worlds, (10 items, α = .81)	3.6 (0.7)	3.6 (0.6)	3.8 (0.5)	3.7 (0.7)	3.7 (0.8)	3.7 (0.7)	3.5 (0.6)	3.6 (0.5)
Value of learning activities beyond school (4 items, α = .68)	2.9 (0.7)	3.0 (0.6)	2.9 (0.5)	2.8 (0.5)	3.2 (0.8)	3.3 (0.8)	2.7 (0.5)	2.8 (0.5)
Cooperation and communication (7 items, α = .71).	3.2 (0.8)	3.3 (0.7)	4.0 (0.6)	3.9 (0.8)	3.3 (0.8)	3.3 (0.7)	2.9 (0.8)	3.1 (0.7)

Note: 1= never, 2= almost never, 3= sometimes, 4= often, 5=very often, 6= always; Total scale for authentic pedagogy includes teachers' intentions regarding authentic pedagogy (12 items).

Table 2: Perception of conditions and problems regarding authentic pedagogy (means and standard deviations)

	Total (n=89)		School A (n=13)		School B (n=34)		School C (n=42)	
Item number	'94	'96	'94	'96	'94	'96	'94	'96
Instructional time blocks are sufficiently long to enable the accomplishment of multi-response tasks	2.6 (1.4)	2.7 (1.4)	3.2 (1.3)	3.0 (1.5)	2.4 (1.3)	2.9 (1.5)	2.5 (1.5)	2.5 (1.2)
Forms of authentic pedagogy are supported on school level (flexible time table, cooperation between subject departments)	2.9 (1.3)	2.8 (1.3)	3.3 (1.4)	3.1 (1.7)	2.7 (1.2)	2.7 (1.1)	2.9 (1.4)	2.9 (1.2)
School offers adequate possibilities to use media (newspaper, radio, t.v)	3.0 (1.5)	2.6 (1.4)	3.3 (1.3)	2.5 (1.3)	4.3 (1.0)	3.6 (1.3)	1.8 (0.9)	1.9 (1.0)
Text book leaves space to design open-ended tasks which allow maximum freedom for students to work	3.0 (1.2)	3.1 (1.2)	3.1 (1.1)	2.8 (1.1)	3.3 (1.2)	3.5 (1.1)	2.8 (1.2)	2.8 (1.3)
School facilities enable students to collect information independently	3.7 (1.5)	3.4 (1.3)	4.3 (1.4)	3.2 (1.3)	4.1 (1.6)	4.0 (1.2)	3.2 (1.4)	3.1 (1.4)
The text book in use encourages the choice of topics from everyday life	4.1 (1.4)	4.0 (1.1)	4.5 (1.0)	4.0 (1.0)	4.5 (1.2)	4.3 (1.1)	3.6 (1.5)	3.7 (1.1)
Lesson content and lesson design are highly dependent on the text book used	4.4 (1.4)	4.5 (1.4)	4.9 (1.0)	4.7 (1.0)	4.4 (1.5)	4.4 (1.4)	4.3 (1.5)	4.6 (1.4)

Note 1= fully disagree, 2= strongly disagree, 3= slightly disagree, 4= slightly agree, 5= strongly agree, 6= fully agree

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Table 3: Scale means for authentic pedagogy, on student questionnaires for English (as a foreign language) and math

	English[1]		Math[2]	
Activities authentic pedagogy	'94 (n=465)	'96 (n= 1014)	'94 (n=438)	'96 (n= 930)
grade 1 (n English= 334, n math= 294)	2.2 (0.4)	2.1 (0.4)	2.3 (0.4)	2.4 (0.4)
grade 2 (n English= 302, n math= 350)		2.2 (0.4)		2.4 (0.4)
grade 3 (n English= 378, n math= 286)		2.1 (0.5)		2.1 (0.4)

Note scale points: 1= never 2= rarely, 3= sometimes, 4= often 5= very often; [1]=22 items, α=.78, [2]=20 items, α=.77

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